

كل يوم  
11:00 - 12:30

Summer 2010

Exam I<sup>st</sup>

Chemistry

Student Name: .....

Name of Lecturer: .....

1. Which one of the these ions is polyatomic ion?

1.  $Al^{3+}$

2.  $CN^-$

3.  $Ga^{3+}$

4.  $Ca^{2+}$

5.  $Sn^{2+}$

2. Which of the following is not a chemical change?

1. iron rusting

2. leaves changing color in the fall

3. liquid water evaporating

4. beef cooking

5. burning a candle

3. Which element listed below is a member of the alkaline earth metal family?

1. Br 2. Ca 3. K 4. S 5. none of these

4. Three problems are worked below. Choose the answer that properly describes the correct use of significant digits.

(a) 0.34

+14.2

14.54

X

14.5

(b) 14.3

$\times 2.0$

28.6

29

X

(c) 14.21

$\times 134$

$1.90 \times 10^3$

✓

$1.90 \times 10^3$

X 1. a and b are correct, c is incorrect

X 2. a and c are correct, b is incorrect

X 3. b and c are correct, a is incorrect

4. only c is correct

5. none of these

5. Express a mass of 1.250 mL in L.

1 L = 1000 mL

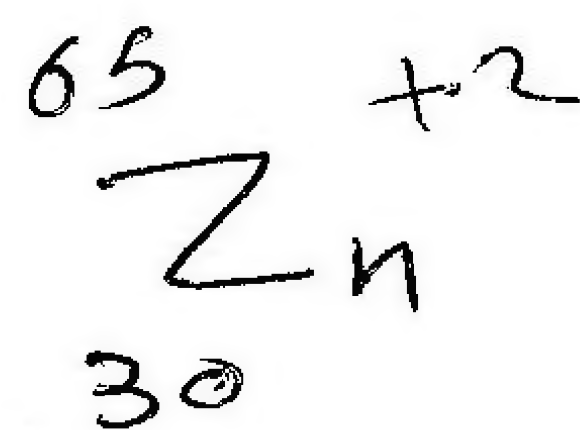
X = 1.25 mL

1) 125.0 L 2)  $1.250 \times 10^{-5}$  L 3)  $1.250 \times 10^{-3}$  L 4)  $1.250 \times 10^{-2}$  L 5) 0.0100 L

6. The nucleus of an atom contains

1. only neutrons 2. only protons 3. neutrons and protons

4. neutrons and electrons 5. electrons, protons, and neutrons



7. The symbol for the species that contains 30 protons, 35 neutrons, and 28 electrons is:

1.  $^{65}\text{Zn}^{2-}$  2.  $^{35}\text{Zn}^{2+}$  3.  $^{63}\text{Zn}^{2-}$  4.  $^{65}\text{Zn}^{2+}$  5. none of these

8. A new element is prepared that has two isotopes. One isotope is 22.00% abundant and has a mass of 103.2 u. The other has a mass of 105.2 u. What is the atomic mass of this element?

1. 103.8 2. 104.8 3. 104.2 4. 104.0 5. none of these

$$\frac{22}{100} \times 103.2 + \frac{78}{100} (105.2)$$

$$22.704 + 82.056$$

$$= 104.76$$

9. How many carbon atoms are in a molecule that has an empirical formula of  $\text{CH}_3$  and a molecular mass of 45u?

1. 1 2. 2 3. 3 4. 4 5. none of these

$$\frac{45}{15} = 3$$

$$3(\text{CH}_3)$$

$$= \text{C}_3\text{H}_9$$

10. The correct formula of the ionic compound made from magnesium and chlorine is:

1.  $\text{MgCl}$  2.  $\text{Mg}_2\text{Cl}$  3.  $\text{MgCl}_2$  4.  $\text{Mg}_2\text{Cl}_2$  5. none of these

11. The formula mass of ammonium carbonate is

1. 83.0 u 2. 96.0 u 3. 138 u 4. 152 u 5. none of these

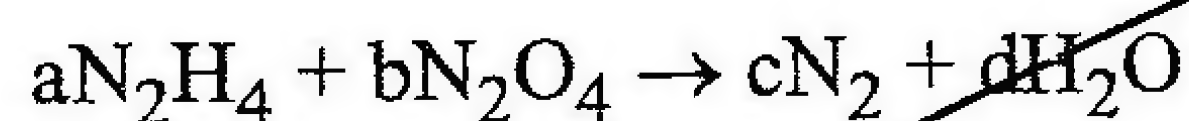
12. The formula of chromium (II) nitride is:

1.  $\text{CrN}_3$  2.  $\text{Cr}(\text{NO}_3)_2$  3.  $\text{Cr}_3\text{N}$  4.  $\text{Cr}_3\text{N}_2$  5.  $\text{Cr}_3\text{NO}_3$

13. Name the compound  $\text{C}_3\text{O}_2$ .

1. carbon oxide  
2. carbon dioxide  
3. tricarbon dioxide  
4. dicarbon trioxide  
5. carbon oxalate

14. What is the ratio of a/b for the equation below where a, b, c, and d represent the coefficients in the balanced equation?



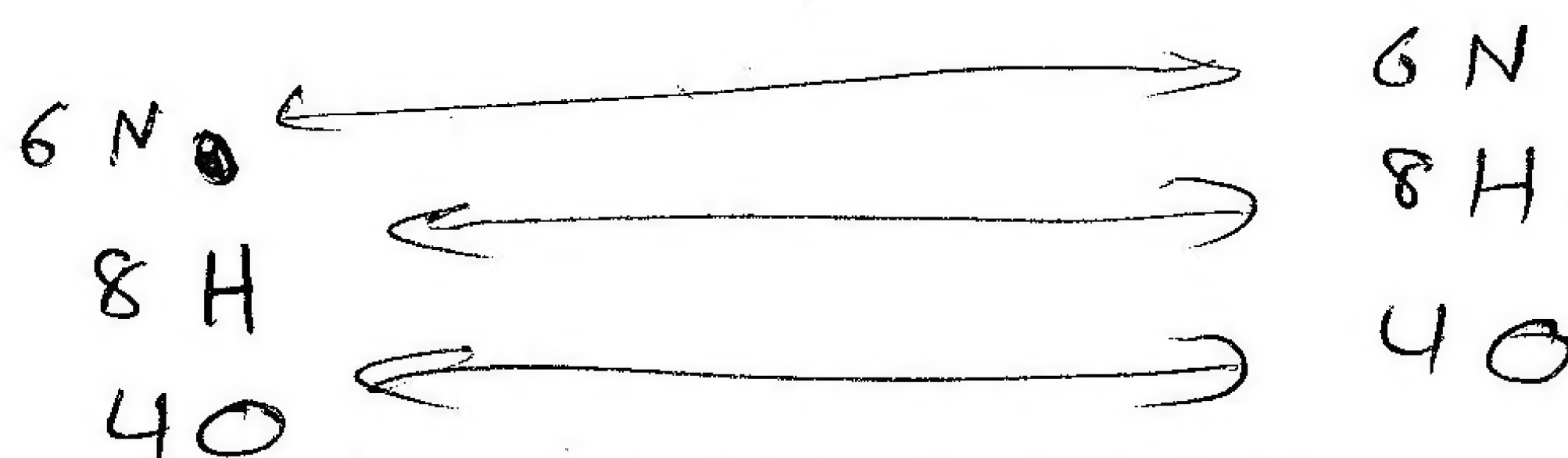
1. 2/1 2. 1/2 3. 3/1 4. 3/2 5. none of these

$$a = 2$$

$$b = 1$$

$$c = 3$$

$$d = 4$$



is balanced



15. When reactants of a chemical reaction are mixed in amounts that are NOT equal to the mass or mole ratios found in the balanced equation, the reactant that determines the actual amount of product produced in the reaction is called the

- × 1. Percent yield.
- 2. limiting reagent
- 3. Active component.
- × 4. Actual yield.
- × 5. Empirical formula.

16. Cathode-ray-tube experiments provided the first evidence for \_\_\_\_\_

- 1. subatomic particles
- 2. x-rays
- 3. fluorescence
- 4. electric fields
- 5. magnetic fields

17. Which element has the electron configuration  $[\text{Ar}]3d^74s^2$ ?

- 1. Cu
- 2. Rh
- 3. Ti
- 4. Br
- 5. Co.

$$18 + 9 = 27$$

18. Which of the following orbitals might have an  $m_l$  equal to +2?

- 1. s
- 2. s and p
- 3. p and d
- 4. s and f
- 5. d and f

$$n = 1, 2, 3, 4, 5, \dots, \infty$$

$$l = 0, 1, 2, \dots, n-1$$

$$s \quad p \quad d \quad f \quad g$$

$$m_l = -l, 0, +l$$

$$m_s = \pm \frac{1}{2}$$

$$p = -1, 0, 1$$

$$d = -2, -1, 0, 1, 2$$

$$f = -3, -2, -1, 0, 1, 2, 3$$

19. How many significant figures should be given in the result of

- 1. 2
- 2. 3
- 3. 1
- 4. 4
- 5. 5

$$\frac{534.71 \times 321.83 \times 0.0019}{7.529 \times 10^{-3}}$$

$$\frac{3.3 \times 10^2}{7.529 \times 10^{-3}} = 4.38 \times 10^4$$

2 s.f.

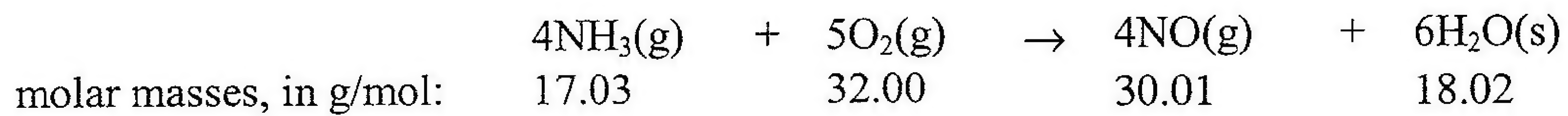
20. Arrange in order of increasing ionization energy:

As, F, N      smallest ----- largest

- 1. As \_\_\_ N \_\_\_ F
- 2. F \_\_\_ N \_\_\_ As
- 3. N \_\_\_ As \_\_\_ F
- 4. As \_\_\_ F \_\_\_ N
- 5. none

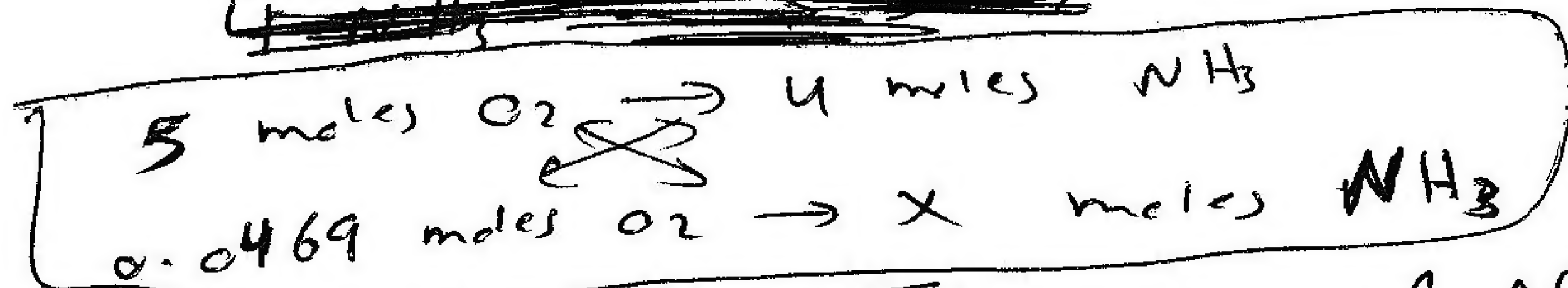
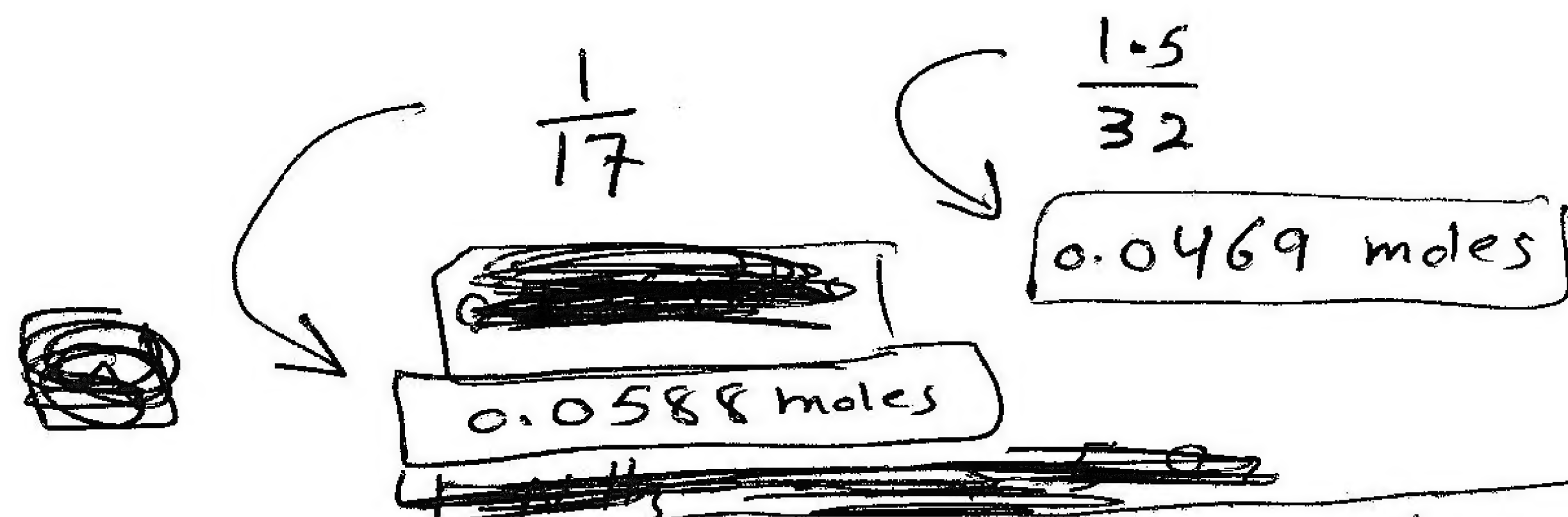
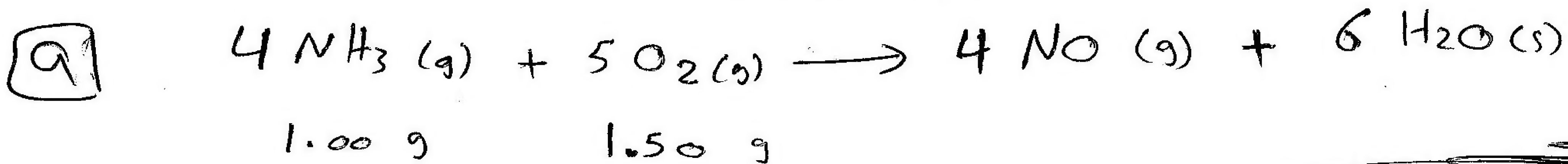
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Q2: (5 points) One of the steps in the commercial process for converting ammonia to nitric acid involves the conversion of  $\text{NH}_3$  to  $\text{NO}$ :



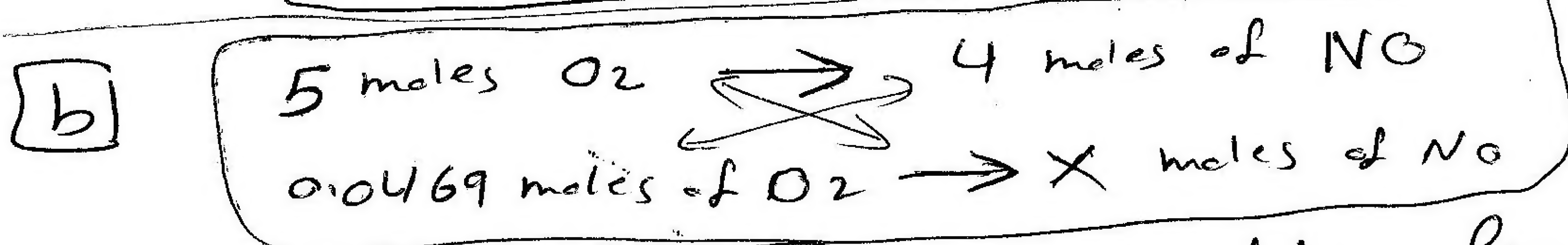
- If 1.00 g of  $\text{NH}_3$  and 1.50 g of  $\text{O}_2$  are mixed, which is the **limiting reactant**?
- What is the **theoretical yield** (in grams) of  $\text{NO}$  that can be produced when the quantities in part a are mixed?
- If 1.05 g of  $\text{NO}$  are actually obtained from the reaction, what is the **percent yield**?

End of Questions



we need 0.0375 moles of  $\text{NH}_3$  for this reaction

excess is  $\text{NH}_3 \Rightarrow \text{O}_2$  is the limiting reactant



we produce 0.0375 moles of  $\text{NO}$  from this reaction

we produce  $(0.0375)(30) = 1.125$  grams of  $\text{NO}$

c)  $\text{Percent Yield} = \frac{\text{actual}}{\text{theoretical}} \times 100\% = \frac{1.05}{1.125} \times 100\% = 93\%$

$= \frac{1.05}{1.125} \times 100\% \approx 93\%$



# PERIODIC TABLE OF THE ELEMENTS

<http://www.ktf-split.hr/periodni/en/>

GROUP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1.0079 <b>H</b> HYDROGEN																	4.0026 <b>He</b> HELIUM
2	6.941 <b>Li</b> LITHIUM	9.0122 <b>Be</b> BERYLLIUM																20.180 <b>Ne</b> NEON
3	22.990 <b>Na</b> SODIUM	24.305 <b>Mg</b> MAGNESIUM																39.948 <b>Ar</b> ARGON
4	39.098 <b>K</b> POTASSIUM	40.078 <b>Ca</b> CALCIUM	69.923 <b>Sc</b> SCANDIUM	78.972 <b>Ti</b> TITANIUM	92.906 <b>V</b> VANADIUM	50.942 <b>Cr</b> CHROMIUM	51.996 <b>Mn</b> MANGANESE	54.938 <b>Fe</b> IRON	55.845 <b>Co</b> COBALT	58.933 <b>Ni</b> NICKEL	63.546 <b>Cu</b> COPPER	65.39 <b>Zn</b> ZINC	69.723 <b>Ga</b> GALLIUM	72.64 <b>Ge</b> GERMANIUM	74.922 <b>As</b> ARSENIC	78.96 <b>Se</b> SELENIUM	79.904 <b>Br</b> BROMINE	83.80 <b>Kr</b> KRYPTON
5	85.468 <b>Rb</b> RUBIDIUM	87.62 <b>Sr</b> STRONTIUM	88.906 <b>Y</b> YTTORIUM	91.224 <b>Zr</b> ZIRCONIUM	92.906 <b>Nb</b> NIOBIUM	95.94 <b>Mo</b> MOLYBDENUM	98 <b>Tc</b> TECHNETIUM	101.07 <b>Ru</b> RUTHENIUM	102.91 <b>Rh</b> RHODIUM	106.42 <b>Pd</b> PALLADIUM	107.87 <b>Ag</b> SILVER	112.41 <b>Cd</b> CADMIUM	114.82 <b>In</b> INDIUM	118.71 <b>Sn</b> TIN	121.76 <b>Sb</b> ANTIMONY	127.60 <b>Te</b> TELLURIUM	126.90 <b>I</b> IODINE	131.29 <b>Xe</b> XENON
6	132.91 <b>Cs</b> CAESIUM	137.33 <b>Ba</b> BARIUM	138.91 <b>La</b> LANTHANUM	178.49 <b>Hf</b> HAFNIUM	180.95 <b>Ta</b> TANTALUM	183.84 <b>W</b> TUNGSTEN	186.21 <b>Re</b> RHENIUM	190.23 <b>Os</b> OSMIUM	192.22 <b>Ir</b> IRIDIUM	195.08 <b>Pt</b> PLATINUM	196.97 <b>Au</b> GOLD	200.59 <b>Hg</b> MERCURY	204.38 <b>Tl</b> THALLIUM	207.2 <b>Pb</b> LEAD	208.98 <b>Bi</b> BISMUTH	209 <b>Po</b> POLONIUM	210 <b>At</b> ASTATINE	222 <b>Rn</b> RADON
7	223 <b>Fr</b> FRANCIUM	226 <b>Ra</b> RADIUM	Ac-Lr ACTINIDE															

## LANTHANIDE

57	138.91	<b>La</b> LANTHANUM	58	140.12	<b>Ce</b> CERIUM	59	140.91	<b>Pr</b> PRASEODYMIUM	60	144.24	<b>Nd</b> NEODYMIUM	61	145	<b>Pm</b> PROMETHIUM	62	150.36	<b>Sm</b> SAMARIUM	63	151.96	<b>Eu</b> EUROPIUM	64	157.25	<b>Gd</b> GADOLINIUM	65	158.93	<b>Tb</b> TERBIUM	66	162.50	<b>Dy</b> DYSPROSIUM	67	164.93	<b>Ho</b> HOLMIUM	68	167.26	<b>Er</b> ERBIUM	69	168.93	<b>Tm</b> THULIUM	70	173.04	<b>Yb</b> YTTERIUM	71	174.97	<b>Lu</b> LUTETIUM
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## ACTINIDE

89	227	<b>Ac</b> ACTINIUM	90	232.04	<b>Th</b> THORIUM	91	231.04	<b>Pa</b> PROTACTINIUM	92	238.03	<b>U</b> URANIUM	93	237	<b>Np</b> NEPTUNIUM	94	244	<b>Pu</b> PLUTONIUM	95	243	<b>Am</b> AMERICIUM	96	247	<b>Cm</b> CURIUM	97	247	<b>Bk</b> BERKELIUM	98	251	<b>Cf</b> CALIFORNIUM	99	252	<b>Es</b> EINSTEINIUM	100	257	<b>Fm</b> FERMIUM	101	258	<b>Md</b> MENDELEVIUM	102	259	<b>No</b> NOBELIUM	103	262	<b>Lr</b> LAWRENCIUM
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(1) Pure Appl. Chem., 73, No. 4, 667-683 (2001)  
Relative atomic mass is shown with five significant figures. For elements with no stable nuclides, the value enclosed in brackets indicates the mass number of the longest-lived isotope of the element.  
However three such elements (Th, Pa, and U) do have a characteristic terrestrial isotopic composition, and for these an atomic weight is tabulated.

Editor: Aditya Verdhnan (adivar@netlinx.com)